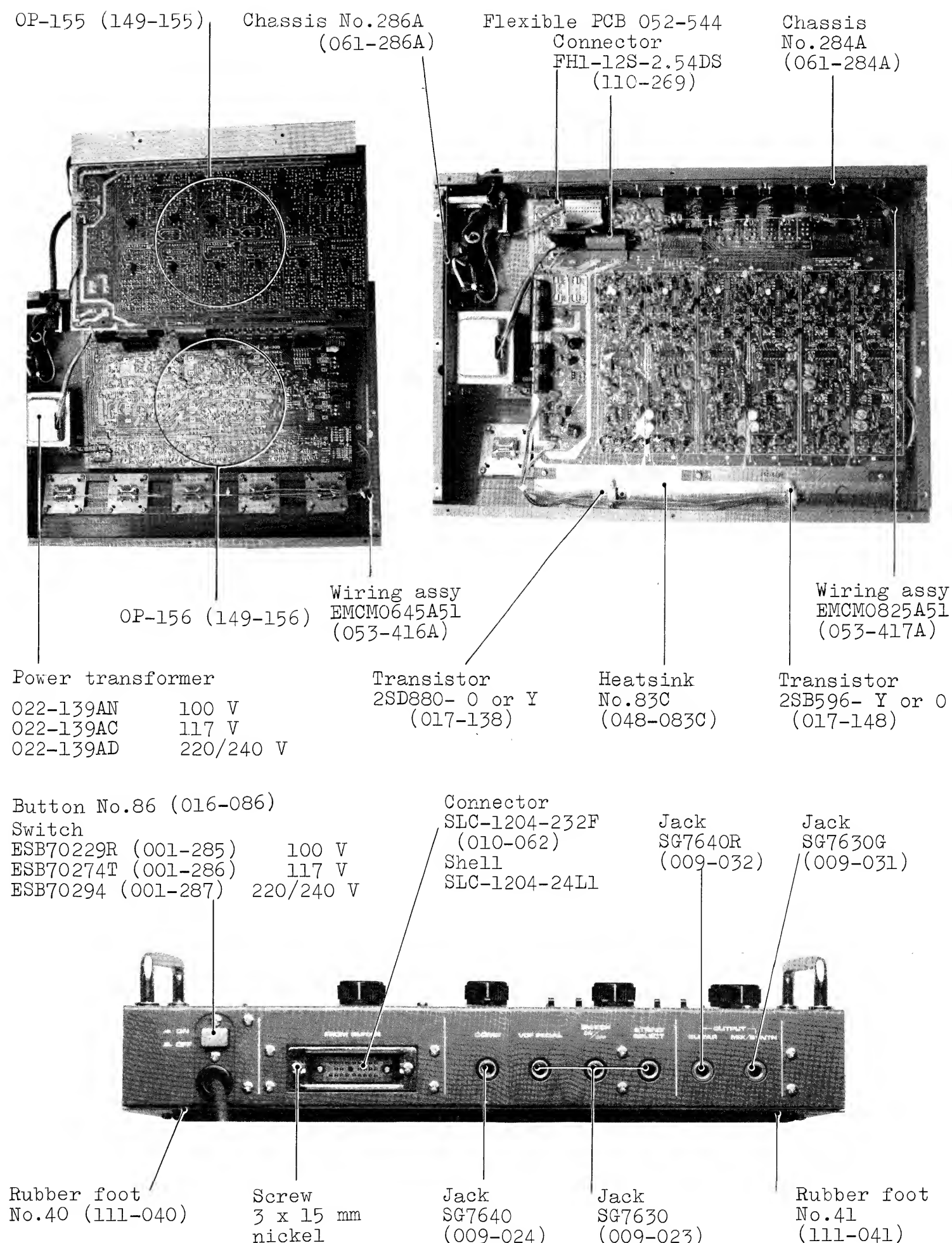
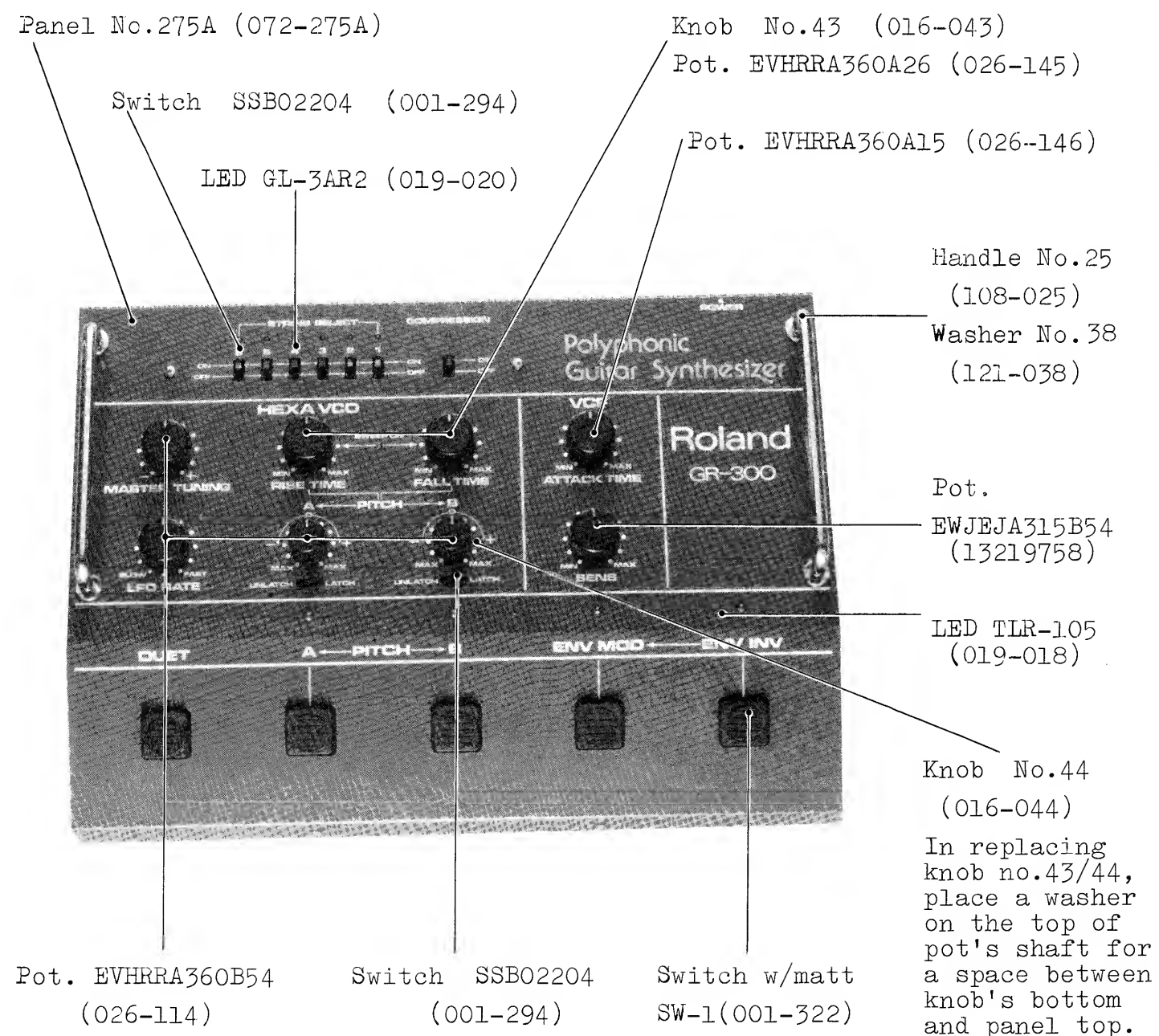


GR-300, G-303/G-808 SERVICE NOTES

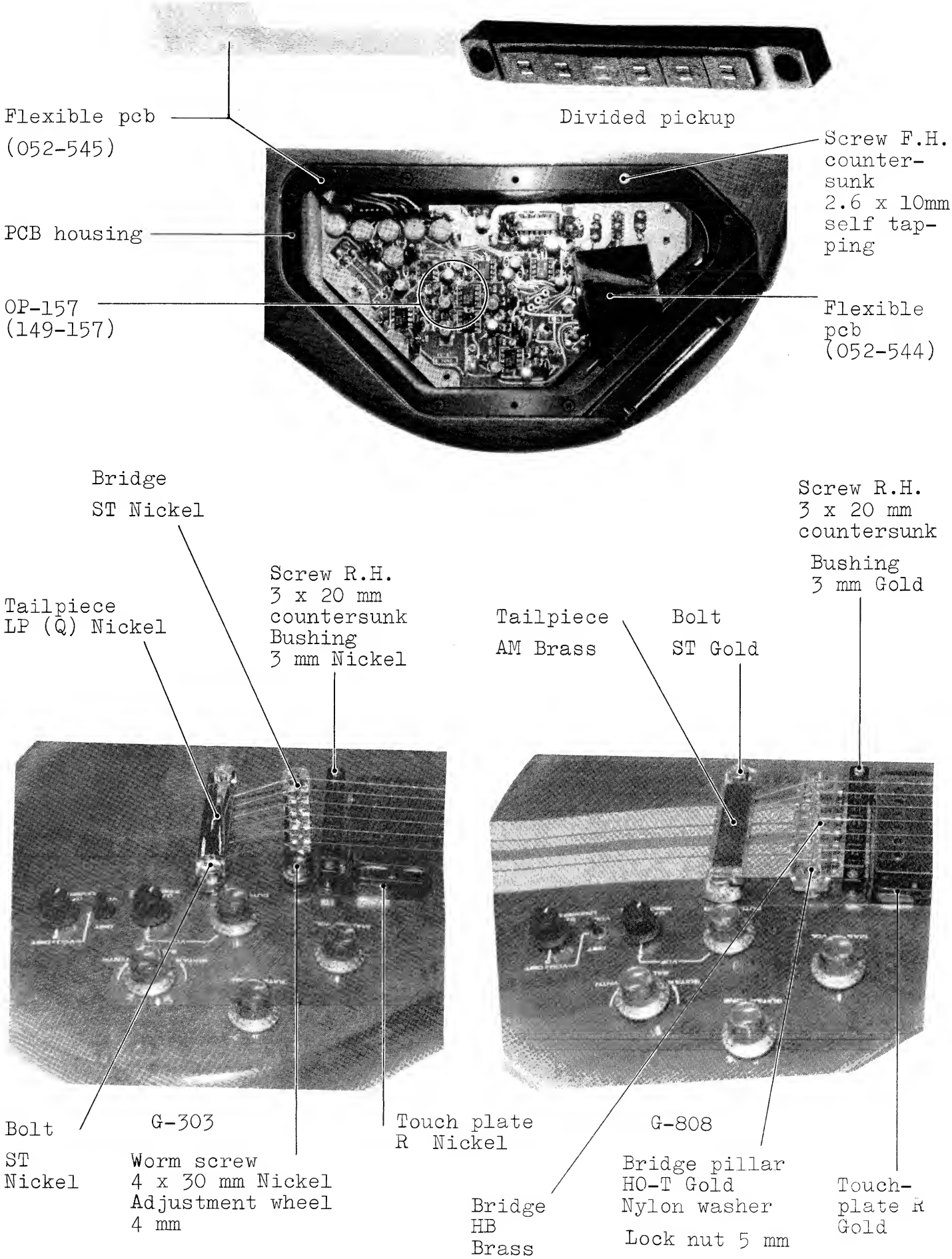
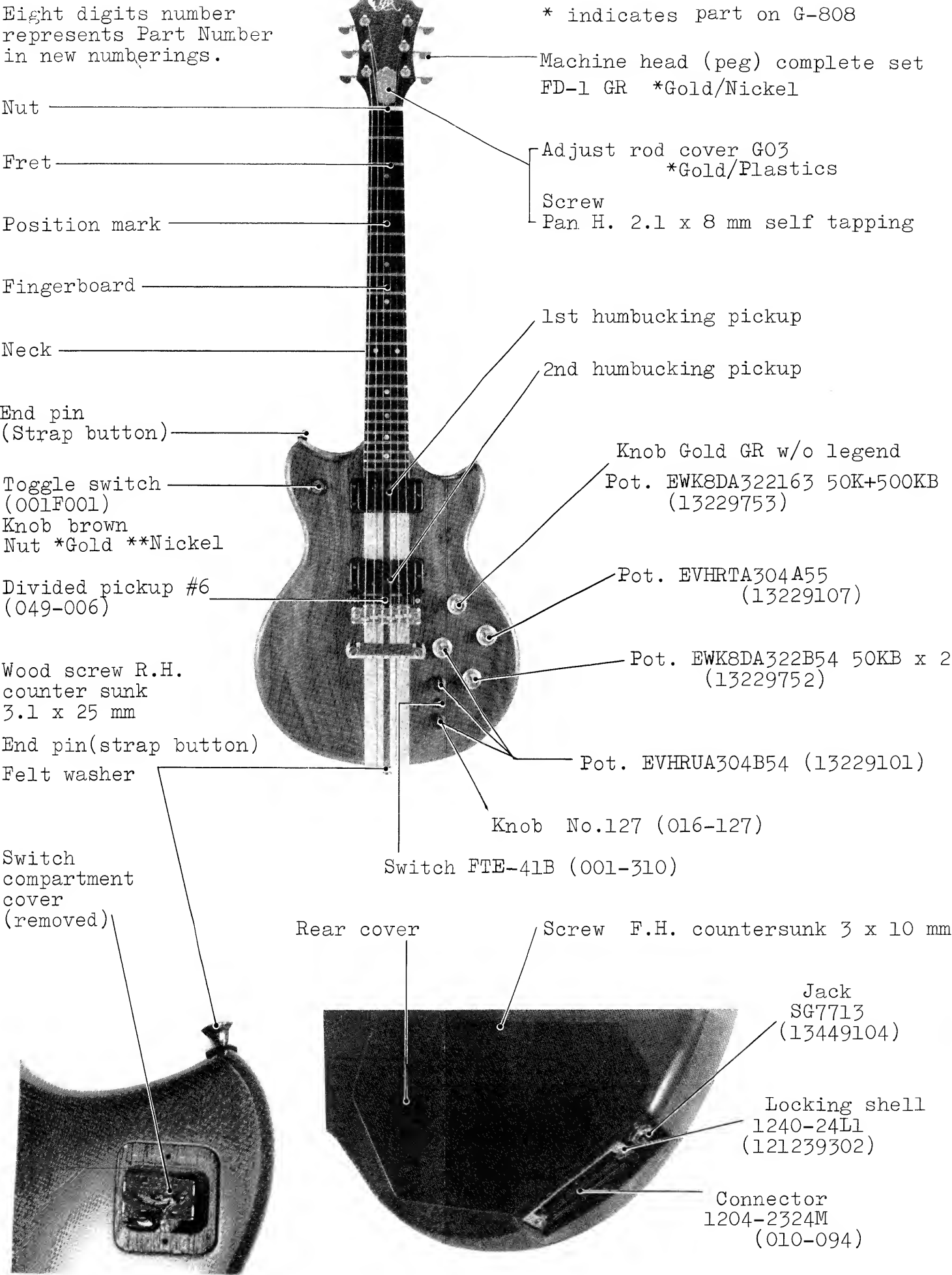
First Edition

SPECIFICATIONS

PITCH SHIFT RANGE --- PITCH A/B: ± 1300 cents LFO RATE -- 2-10Hz
 SWEEP RISE TIME ---- 0-6 seconds VCF ATTACK TIME -- 0-2 seconds
 SWEEP FALL TIME ---- 0-6 seconds POWER CONSUMPTION -- 20 watts
 DIMENSIONS ----- 400 (W) x 290 (D) x 100 (H) mm
 WEIGHT ----- GR-300: 5 kg; G-303, G-808: 4.2 kg



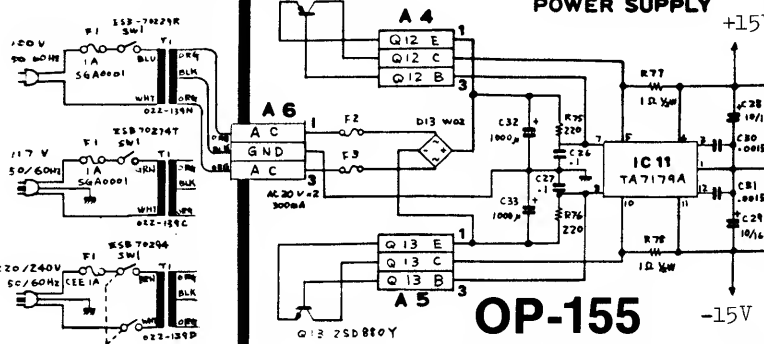
Eight digits number represents Part Number in new numberings.



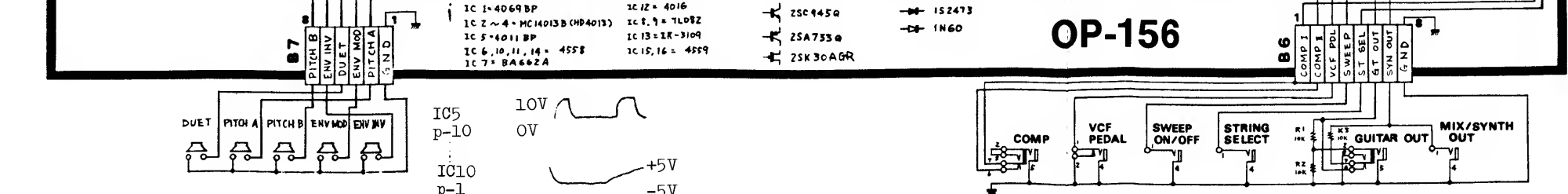
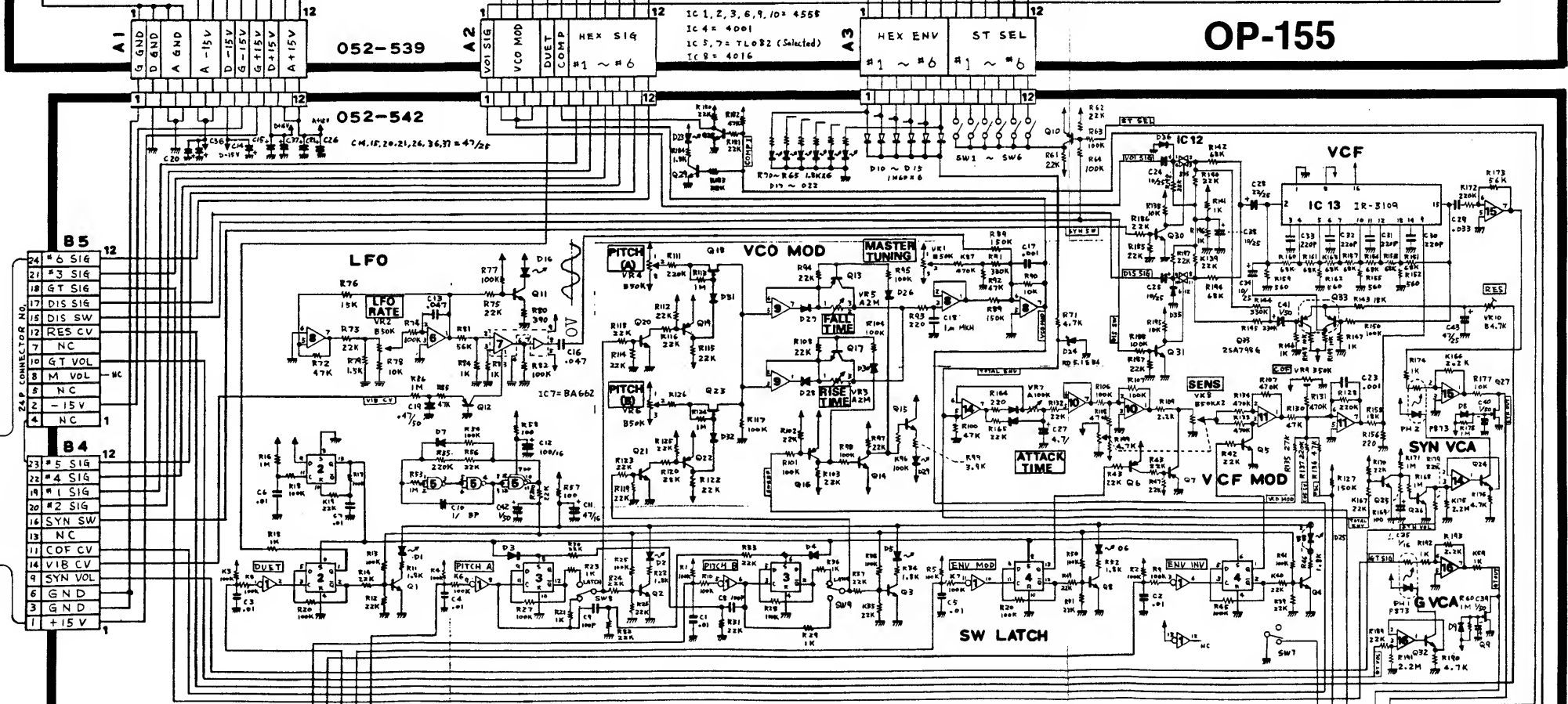
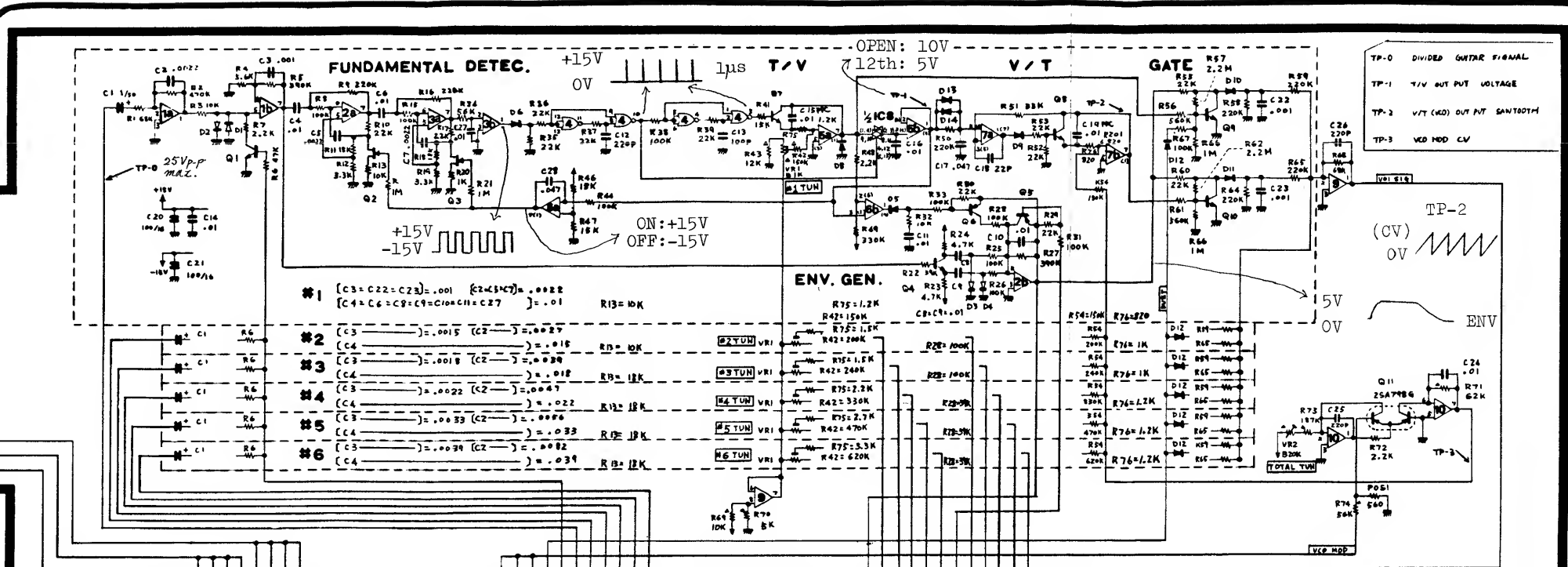
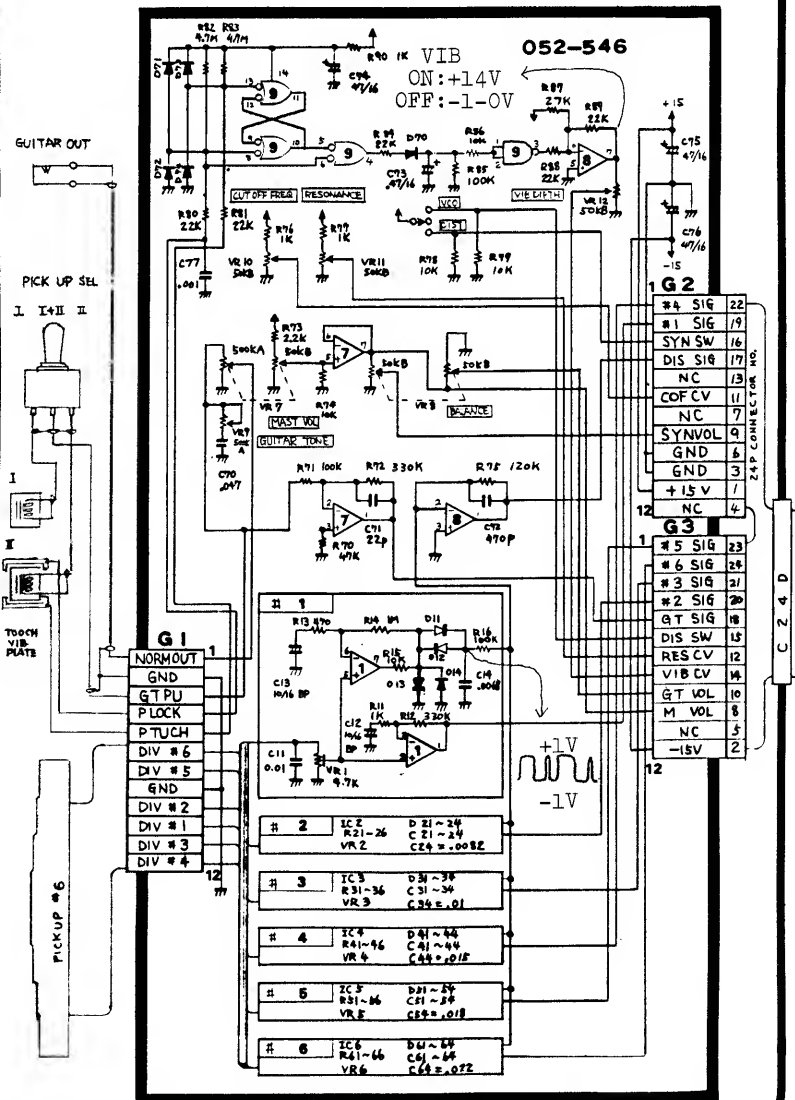


CIRCUIT DIAGRAM
Roland

GR-300



G-303, G-808 OP-157



CIRCUIT DESCRIPTION

GR-300 circuits are mostly built on two circuit boards: VOICE Board OP-155 and GATE Board OP-156.

VOICE BOARD OP-155

1. FUNDAMENTAL DETECTOR
2. T/V CONVERTER
3. V/T CONVERTER
4. ENVELOPE GENERATOR
5. CHOPPER GATE
6. POWER SUPPLY

1. FUNDAMENTAL DETECTOR

This detector, the heart of GR-300 Guitar Synthesizer, strips the incoming signal off harmonics and leaves fundamental. In the following, only channel #1 circuit is described since this detector is composed of the same six circuits. The output signal coming from the divided pickup is applied through LPF/Buffer IC1a to COMPRESSION circuit consisting of switching transistor Q1 and clamp ciodes D1 and D2.

GR-300

With COMPRESSION at control panel "off", the signal potential is divided by R3 and R7; when "on", the signal remains unchanged and is applied to LPF IC1b.

1-1. Band-Pass Filter (BPF). A two-stage filter, consisting of cascaded IC2a and IC3a, largely changes its frequency response when a string is plucked with lower fretting and then with upper fretting, and vice versa.

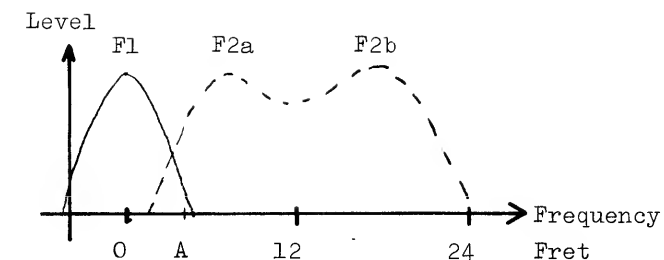


Fig. 1 Filter changes frequency response according to the fret position.

When channel #1 string pressed at lower fret (0-6th) is played, Q2 and Q3 are cut off by the potential at output of IC6a which senses T/V output (IC5b) and applies forward biases to Q2 and Q3 when the string pressed at a fret higher than point A of the figure above is played (more detail about IC6a in later section ENV. GENERATOR).

Q2 and Q3, during off, make 1st and 2nd filters' component values equal to each other to provide overall peak frequency at F1 corresponding to fundamental of the open string. The filter attenuates 1st overtones or harmonics by 24dB when fretted-notes lower than point A are played.

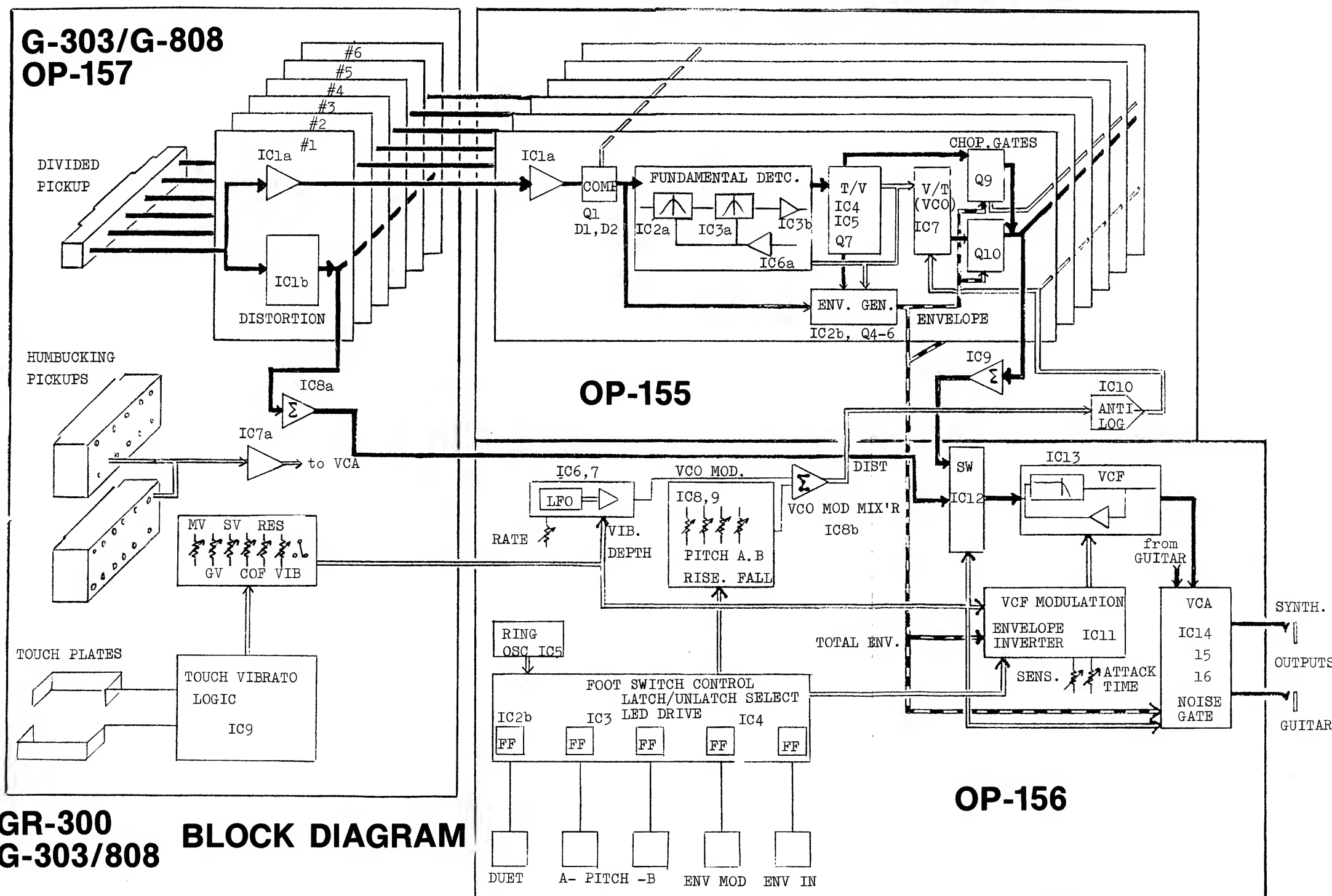
The switching FETs Q2 and Q3 with R13 and R20 connected hold two filters differently during their conducting period. This results in two discrete peak frequencies: F2a (frequency around 5-6th frets) from IC2a and F2b (around 18th fret frequency) from IC3a.

Second harmonics of the fret-notes in this region are also rolled off by 24dB.

NOTE: These response curves do not affect sound volume since signal passing through the filter is used only for pitch decision.

The fundamental is trimmed into square wave through comparator IC3b, and is applied to the next stage, T/V converter IC4.

G-303/G-808 OP-157



GR-300 G-303/808 BLOCK DIAGRAM

2. T/V CONVERTER

This circuit is composed of two-stage mono-stable multivibrator IC4(MM1,MM2), constant-current integrator Q7, IC5a, D8, and sample and hold circuit IC8a, IC5b.

MM1 and MM2 output lps wide positive-going pulses c and d upon receiving edges of respective inputs. There is some time difference between pulses c and d due to the time constant of R38 and CMOS's input capacitance.

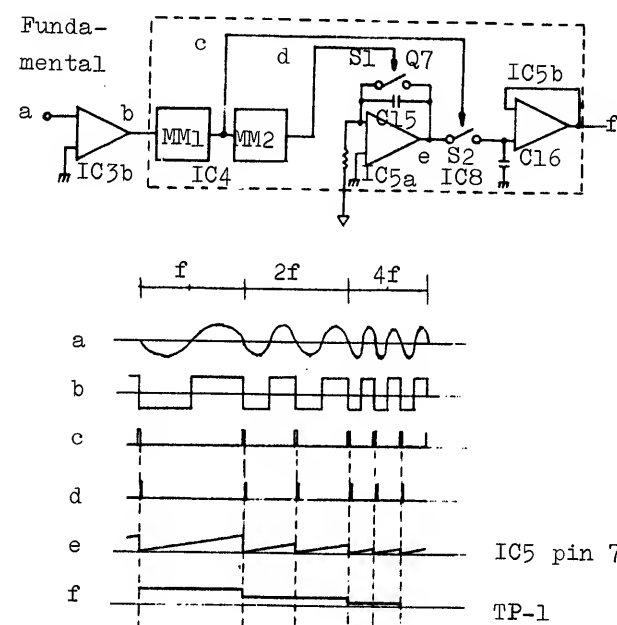


Fig. 2 T/V Converter Timing chart

The voltage across capacitor C15 increases linearly when charged at a constant rate, and decreases to zero when pulse d triggers Q7. The voltage across D8 (pin 7 of IC5a) takes the shape of sawtooth e. Its maximum value is proportional to the interval length between two pulses; 0-10V at open string, and 0-5V at 12th fret.

The sawtooth waveform serves as a fundamental when DUET is on.

The waveform is sampled by $\frac{1}{2}$ IC8 each time pulse c is applied and is held by C16 before being reset by pulse d. Dc output from IC5b is then applied to IC7a.

3. V/T CONVERTER (VCO)

This V/T converter is similar to the T/V converter in operation. When the charge on C19 increases constantly and reaches the potential equal to that on C17, it causes output from IC7a to conduct Q8 taking the shape of sawtooth waveform whose amplitude is inversely proportional to fret frequency, that is, the lower the fret, the higher the amplitude. This VCO waveform can be modulated or shifted by varying the current flowing into C19. The more the current, the faster C19 charges up to the level on C17. As a result, VCO frequency increases with its amplitude held constant.

4. ENVELOPE GENERATOR

This is an envelope follower with reset function added -- comparator IC6b and switching transistors Q5, Q6 across C10.

IC6b compares the signal levels between input and output terminals of S/H circuit. When the waveform at IC5a output includes 1st overtone component to some degree, IC6b outputs negative-going voltage, conducting Q6 to discharge C10 so that the generator does not output signals. While transients are smoothed out by C11 in the circuit.

IC6a, as described in section BPF, turns Q2 and Q3 on or off when output from IC5b jumps up or down from the predetermined level across R47, which corresponds to point A in figure 1. When a string is stroked powerfully with a fret higher than point A is pressed, it vibrates transiently at very low frequency, which causes the filter switch to F1 response, then to F2a, F2b as the string vibrates at inherent frequency. However, abrupt change of filter response is not favorable because it produces click-like sound. Intergrating capacitor C28 absorbs the initial transient.

CONTROL BOARD OP-156

The following are main circuits on the board.

1. FOOT SWITCH CONTROL
2. LFO
3. VCO MOD (PITCH SHIFT)
4. VCF
5. ELECTRONIC VOLUME CONTROL

1. FOOT SWITCH CONTROL

Pressing the footswitch (momentary-close type) applies trigger pulse to C (clock) pin of flip-flop IC2b (IC3,4) through buffer IC1. In this configuration D-F/F is connected as type T-F/F. Capacitor 0.01μF across the switch prevents contact bounce (chattering) which could cause false triggering.

IC2a generates initial reset pulse for other F/F's when the power switch is turned on.

Outputs from Ring Oscillator IC5 and the F/F are ORed at the base of LED driver Q8 (Q1-4). LED blinks at the rate of oscillator output when F/F is reset.

2. LFO

One half of IC6 forms hysteresis comparator and the rest half acts as a miller integrator, generating triangular output waveform. The waveform is applied to VCO MOD mixer via IC7, whose gain is current-controlled by VIB DEPTH.

3. VCO MOD (PITCH SHIFT)

When PITCH A (B) is pressed, Q18 (Q23) turns on, and the voltage determined by VR4 (VR5) is fed to IC8 via ideal diode IC9. When PITCH is shifted from A (B) to B (A) by pressing the PITCH footswitch with FALL (RISE) TIME turned partly. The RC time constant of pot and C18 causes voltage to change slowly which is supplied to pin 2 of IC8. When external footswitch plugged into SWEEP ON/OFF jack is turned on, forward voltage is applied

to bases of Q13 and Q17, allowing them to disable SWEEP TIME setting by shunting the VR5 or VR3.

4. VCF

One chip VCF comprising anti-log circuit makes up 24dB/oct LPF along with its external R's and C's. The output is positively fed back to its input for resonance effect via Q33 VCA whose gain or amount of regeneration is controlled by RESONANCE on the guitar controller.

When emphasis is high at a frequency, resonance curve lower than the peak frequency decreases in level, resulting in relatively small VCF output in this region. This detrimental effect is compensated for by parallely feeding the audio signals via VCA which controls amount of feedback and signals at the same rate.

Besides various control volgates, VCO MOD is fed to VCF control pin via IC11b to shift VCF cutoff point in accordance with pitch shift at VCO to maintain unchanged tonal.

With ENVELOPE MODULATION "on", individual envelope outputs on VOICE board can be used to modulate VCF. After its rise time set by ATTACK TIME, envelope signals are routed to IC11a which inverts the envelope slope when ENV IN is "on" because its non-inverting pin is grounded via Q5.

5. ELECTRONIC VOLUME CONTROL

Before being output from OUTPUT jacks, the audio signals are controlled their volumes electronically by PH1 and PH2 which are in turn remote-controlled on the guitar controller.

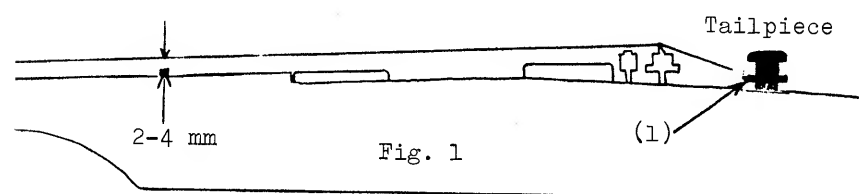
Output from NOISE GATE Q25, Q26 is also applied to PH2 through IC14. This configuration, when ENV GEN outputs zero volt, disables IC15, shutting off the residual noise in the synthesizer channel.

1. PRELIMINARY ADJUSTMENT

If pickups, tailpiece, truss rod and/or bridge appear(s) to have been readjusted or replaced on a given Guitar Controller, the following adjustments must be properly completed before carrying out the individual adjustments now being required.

1-1. TAILPIECE - Fig. 1 -

Using an appropriate straight-blade screwdriver, lower the tailpiece by turning Height Adjustment screws, but high enough to avoid flange backs (1) being in contact with guitar top, which would cause damage to surrounding finish when strings are brought to full tension.



1-2. BRIDGE (coarse) - Fig. 1 -

(Action height at the higher fret)

When the bridge is a replacement for original one, adjustments for centering the bridge(p.7) precedes the following.

. Tighten the strings to eliminate slacks.

The distance between bottom of each string and higher frets must be within 2-4 mm, if not, adjust the bridge height:

G-303 -- Raise or lower the bridge by turning the wheels on the studs, use hand tool (long-nose pliers will suffice) if stiff.

G-808 -- Turn slotted bridge pillar. If frozen, loosen lock nut before screwing.

If any string is coming to touch a pickup, lower the pickup.

Adjustments must be carried out in order, as follows:
(1) TRUSS ROD; (2) ACTION HEIGHT; (3) STRING LENGTH.

2. TRUSS ROD

Checking the fingerboard and neck for cambered, warped, pulled or twisted - Fig. 2 -

1. Hold the neck joint with one hand (1); with the other hand, gently hold the guitar head (2). Position the guitar on the table.

2. View the curve of the fingerboard and neck across the top of the head from both edges alternately (3).

B to H in Fig. 2 are examples of would be occurred. Of course any combinations of these examples might be found on the guitar.

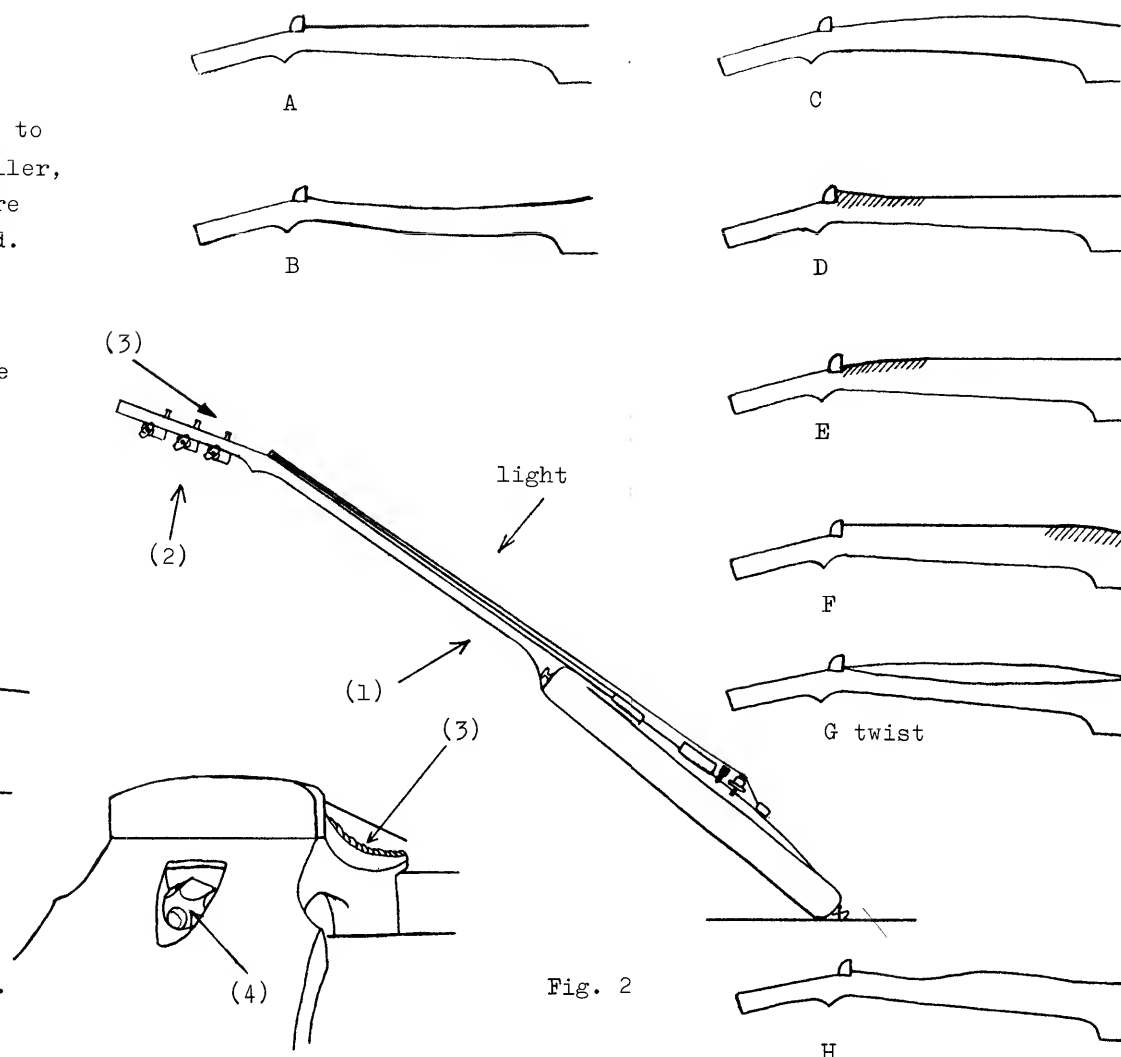


Fig. 2

To adjust truss rod, remove the rod cover.

When adjusting, tighten or loosen the nut (4), with an 8 mm wrench, small amount at a time while checking the result. DO NOT OVERTIGHTEN.

A ----- Ideal.

B, C, D -- Adjust truss rod. Check that there is no buzzing when the string is played open. (Slighter curvature shaded in D can be ignored.)

E, F, G, H -- When possible action is cannot obtained after compensated for by truss rod adjustment, any adjustments it needs should be left to someone with experience on guitar repair.

3. ACTION (STRING) HEIGHT

(Bridge adjustment) - Fig. 3 -

Action height adjustments must be taken with a full set of strings on the guitar, the gauge and type will be used, tuned to playing pitch.

1. Hold the guitar perpendicular to the bench.

2. With the string open, measure the distance between 14th fret and the bottoms of 1st and 6th strings. Standard clearance: 1st -- 1.5 mm
6th -- 2.0 mm

3. To adjust, raise or lower the bridge in the same fashion described in preliminary adjustments 1- 1-2 BRIDGE.

(G-808 -- Lightly wrench the lock nuts on the bridge.)

4. PICKUP HEIGHT

4-1. 1st and 2nd humbuckings - Fig. 3 -

Possible action on guitar pickup depends greatly on strings and players, with strings supplied 3-4 mm works well.

However, pickups' top surfaces must be held parallel to the strings and 1st and 2nd pickups must delivery an equal output sound in level.

4-2. Divided pickup - Refer to page 7 -

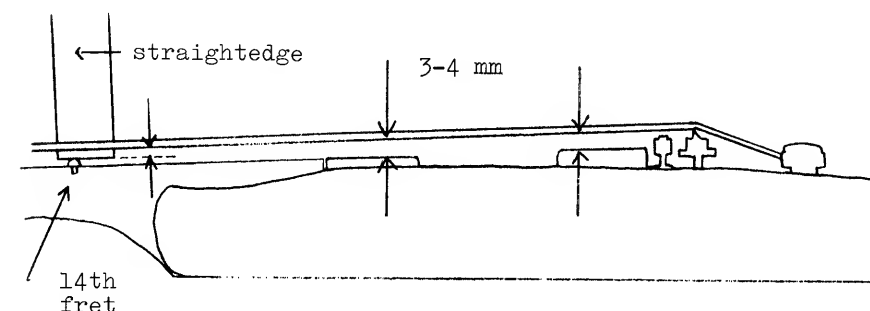


Fig. 3

5. STRING LENGTH (OCTAVE ADJUSTMENT)

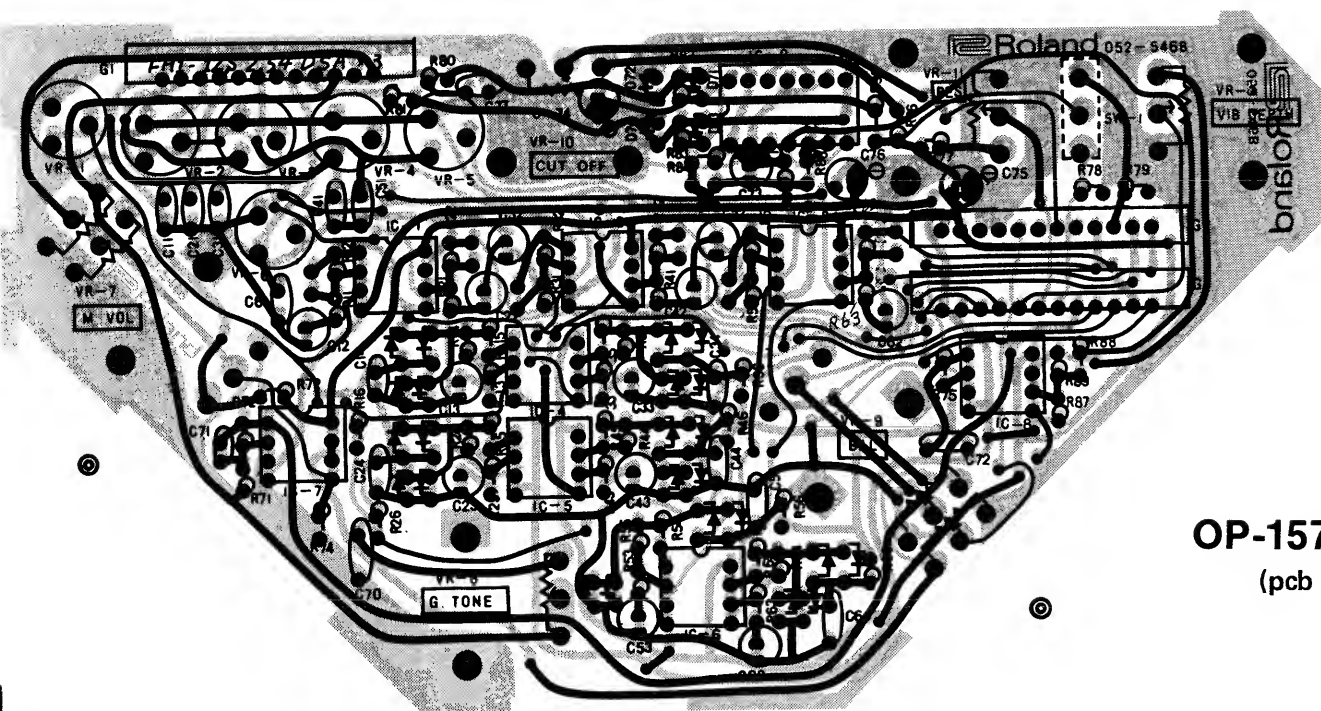
1. Test intonation at the 12th fret whether string is sharp or flat in terms of overall intonation.

2. If a string is going sharp at the 12th fret, move back the saddle to add string length by turning the intonation adjustment screw at the bridge frame. If flat, forwards.

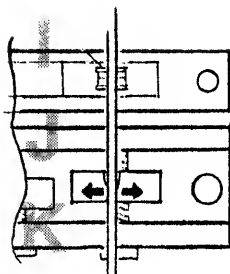
REFERENCE FREQUENCIES

FRET	STRING					
	6	5	4	3	2	1
0	82.41	110.00	146.83	196.00	246.94	329.63
1	87.31	116.54	155.56	207.65	261.63	349.23
2	92.50	123.47	164.81	220.00	277.18	369.99
3	98.00	130.81	174.61	233.08	293.66	392.00
4	103.83	138.59	185.00	246.94	311.13	415.30
5	110.00	146.83	196.00	261.63	329.63	440.00
6	116.54	155.56	207.65	277.18	349.23	466.16
7	123.47	164.81	220.00	293.66	369.99	493.88
8	130.81	174.61	233.08	311.13	392.00	523.25
9	138.59	185.00	246.94	329.63	415.30	554.37
10	146.83	196.00	261.63	349.23	440.00	587.33
11	155.56	207.65	277.18	369.99	466.16	622.25
12	164.81	220.00	293.66	392.00	493.88	659.26
13	174.61	233.08	311.13	415.30	523.25	698.46
14	185.00	246.94	329.63	440.00	554.37	739.99
15	196.00	261.63	349.23	466.16	587.33	783.99
16	207.65	277.18	369.99	493.88	622.25	830.61
17	220.00	293.66	392.00	523.25	659.26	880.00
18	233.08	311.13	415.30	554.37	698.46	932.33
19	246.94	329.63	440.00	587.33	739.99	987.77
20	261.63	349.23	466.16	622.25	783.99	1046.50
21	277.18	369.99	493.88	659.26	830.61	1108.73
22	293.66	392.00	523.25	698.46	880.00	1174.66
23	311.13	415.30	554.37	739.99	932.33	1244.51
24	329.63	440.00	587.33	783.99	987.77	1318.51

A
B
C
D
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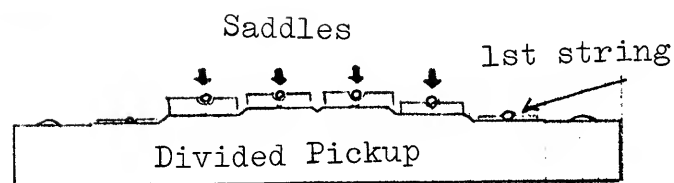


OP-157B (149-157B)
(pcb 052-546B)



Divided Pickup

Bridge



CENTERING THE STRING ON THE PICKUP HEAD

When bridge is replaced, it is necessary to check the strings that they are properly aligned with the center of the divided pickup heads. If not, the following adjustment must be done. This is a deceptively difficult operation that should be left to the hands of an experienced and skilled guitar repairman.

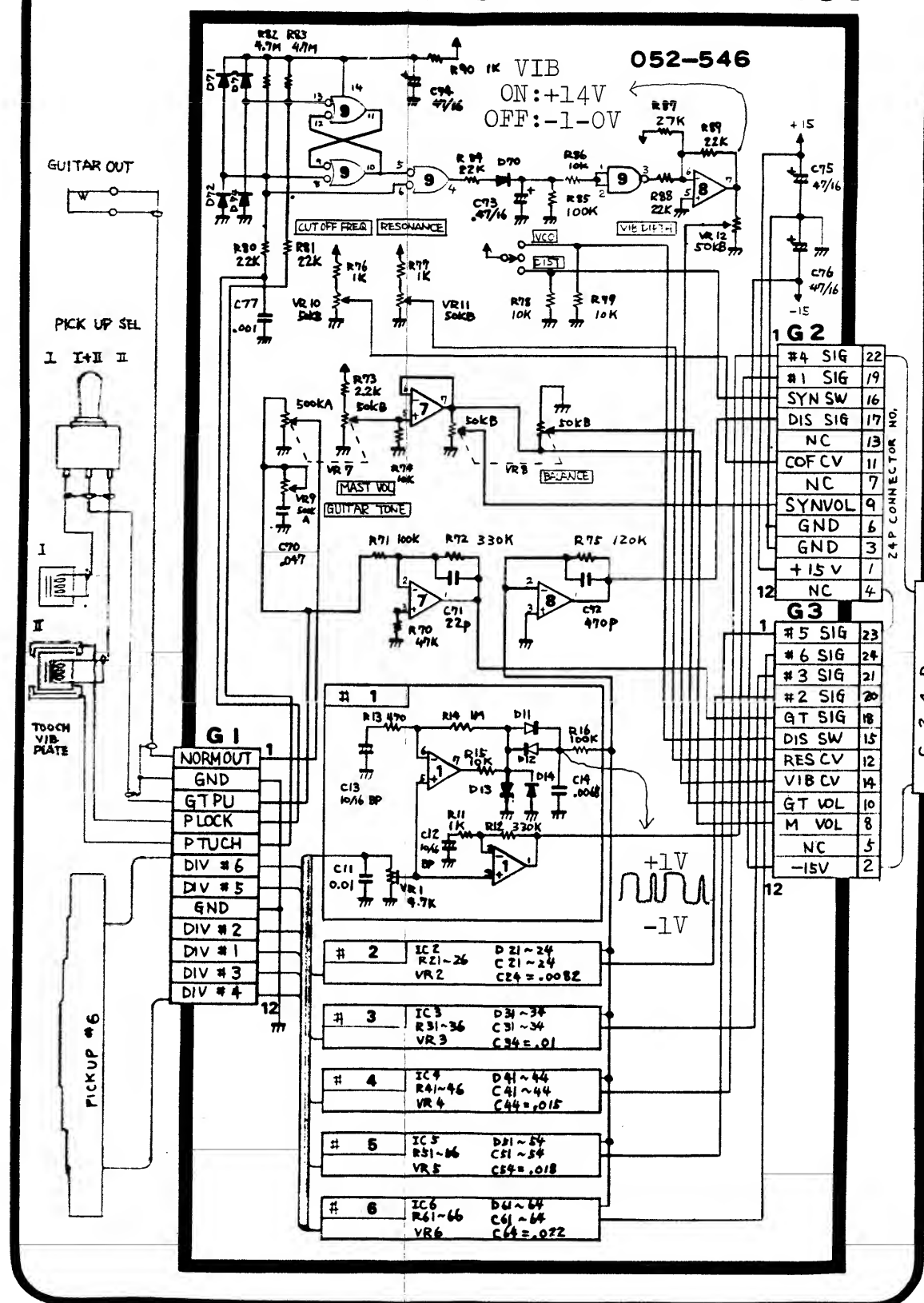
1. Remove the string from its notch, and slide it across the insert (saddle) surface until it reaches the center of the head.

2. Renotch the saddle or enlarge the groove by using a small tri-cornered file. Proceed to PRELIMINARY ADJ.

ADJUSTING DIVIDED PICKUP HEIGHT

1. Tune strings to playing pitch.
2. Raise divided pickup by turning height adjust screws until 1st and 6th pickup heads touch the bottom of respective strings.
3. Check 2nd to 5th strings for contact with the heads, if there is a clearance between them, slot the groove deeper until string touches the head.
4. After all strings rested on heads, lower the pickup. Press 22nd frets. 0.5-0.8 mm between each pickup and bottom of each string is specified action height.

G-303, G-808 OP-157



NOTES: 1. VR1-VR6 are set in mid-position at factory and may be readjusted as required. Maximum output at connector pin (e.g. #1 SIG) is typically 25 Vp-p when plucked powerfully.

ADJUSTING VCF

DO NOT ATTEMPT THIS ADJUSTMENT PRIOR TO COMPLETION OF VCO TUNE.

CUTOFF FREQUENCY

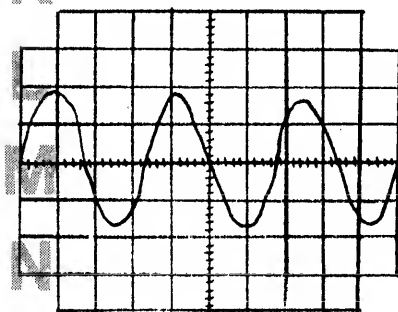
1. Turn RES VR10 full clockwise(FCW),through hole in the pcb from the foil side. VCF will oscillate when a string is plucked.

2. Play a string at open and adjust COF VR9 for 6kHz -- Fig. 1.

RESONANCE

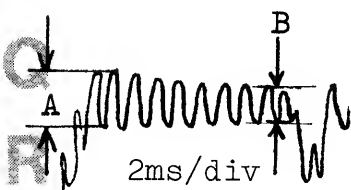
1. With RES VR10 set at FCW, reset CUTOFF FREQ on G-303/808 to 5.

2. Pluck 6th string at open. Adjust RES VR10 for A:B = 2:1 -- Fig.2.



50µs/div

Fig. 1



2ms/div

Guitar controller
CUTOFF FREQ.: 5
RESONANCE: 10
6th string: open

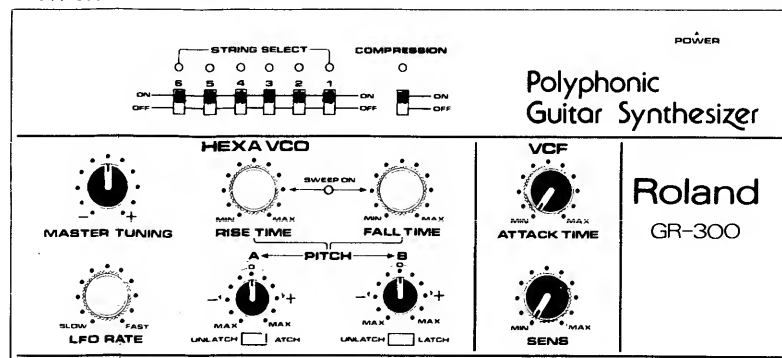
Fig. 2

Set controls as illustrated at the right (footswitches: all off).
Connect oscilloscope to MIX/SYNTH jack.

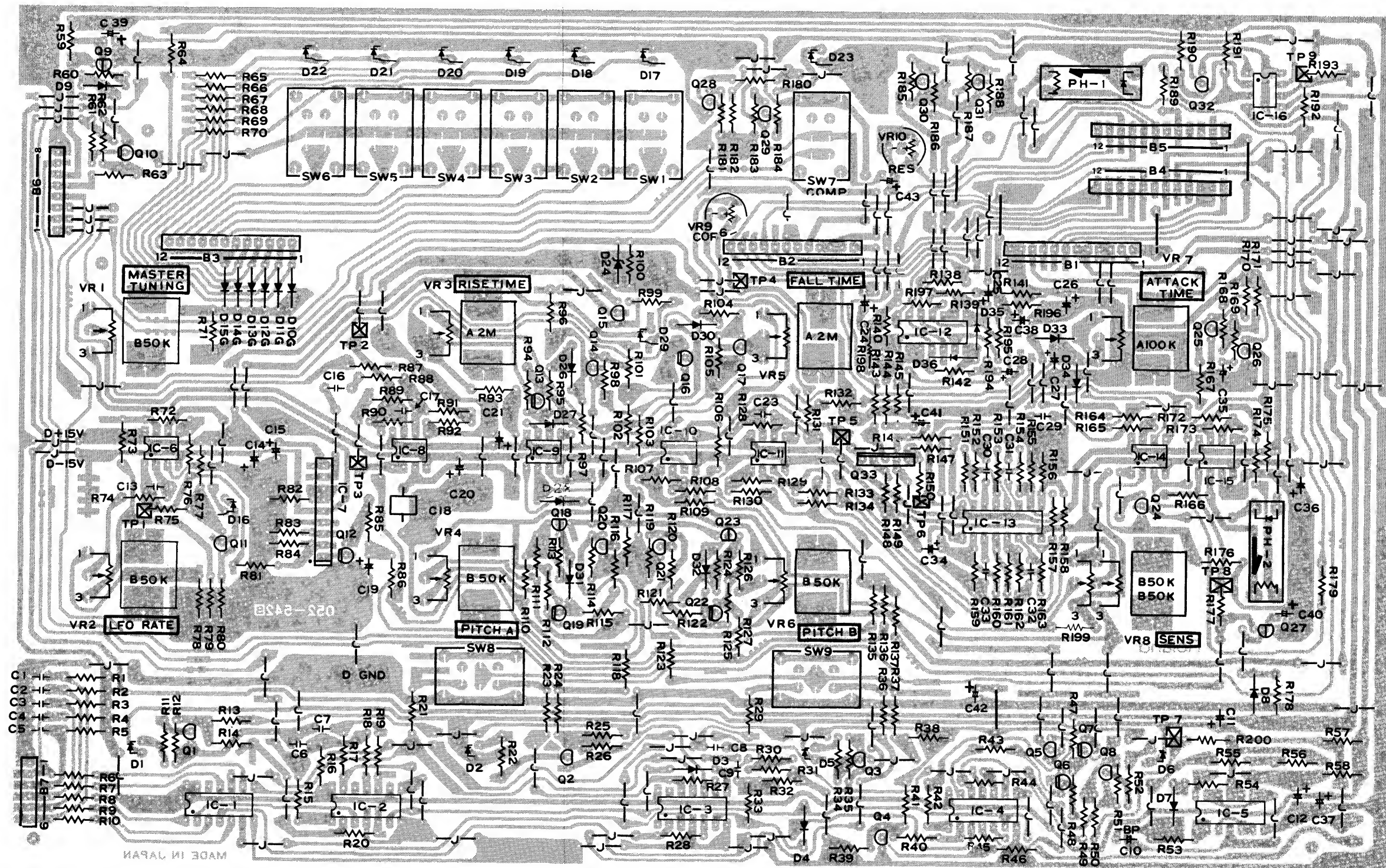
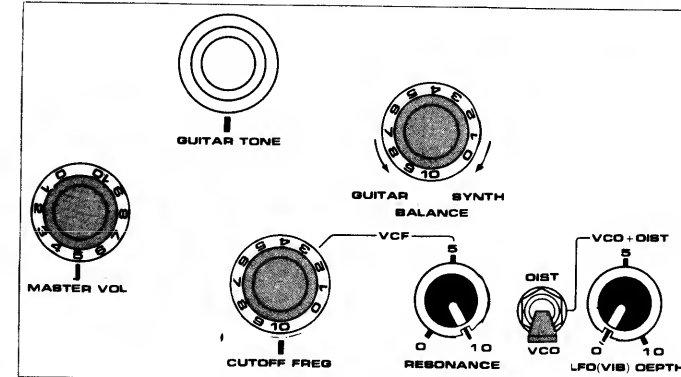
OP-156B (149-156B)

(pcb 052-542B)

GR-300

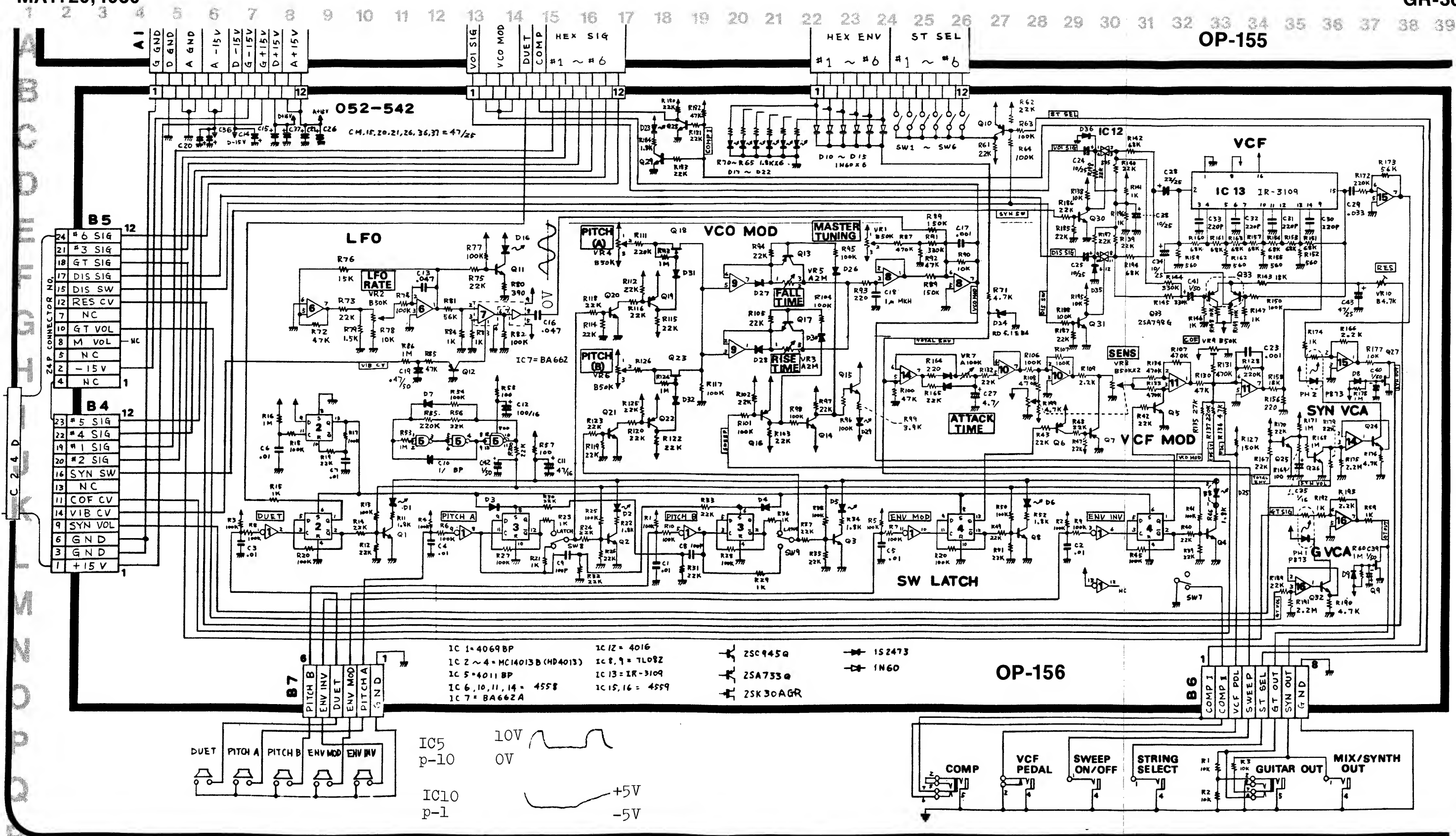


G-303/808

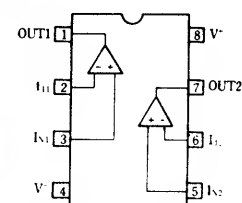


OP-155

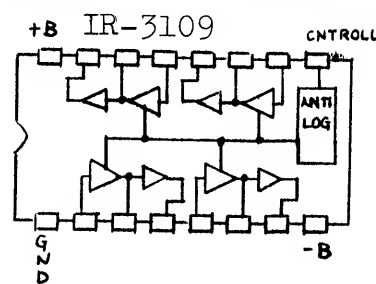
OP-156



OP AMP
uPC4558, uPC4559
TL082

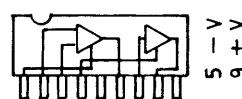


ONE CHIP VCF



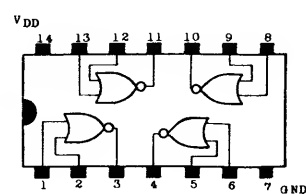
ONE CHIP VCA

BA662



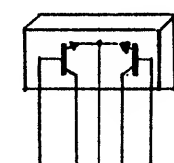
QUAD NOR

14001



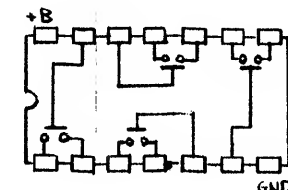
PAIR TRANSISTOR

2SA798



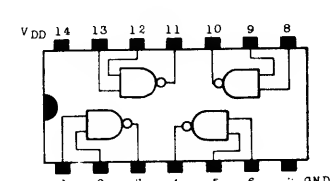
QUAD ANALOG SWITCH

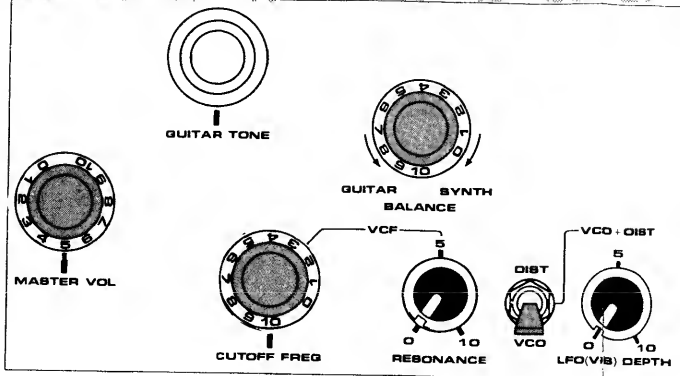
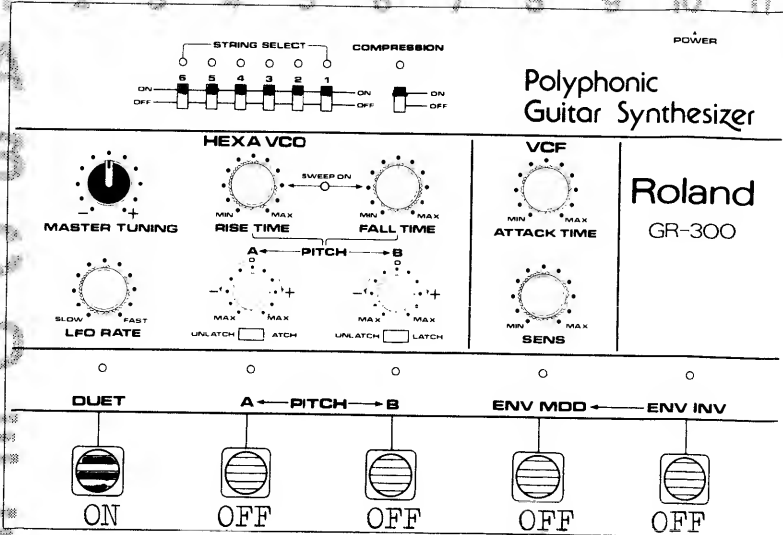
14016



QUAD NAND

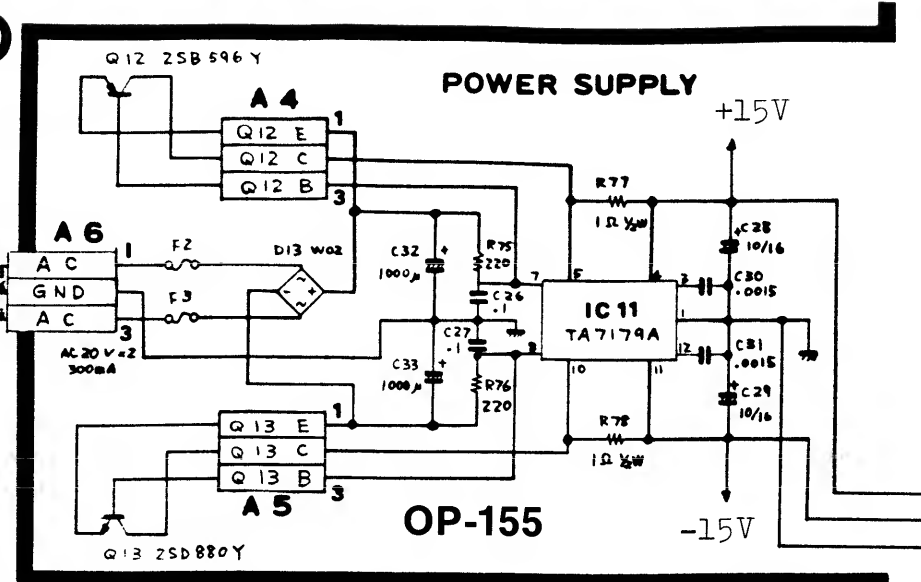
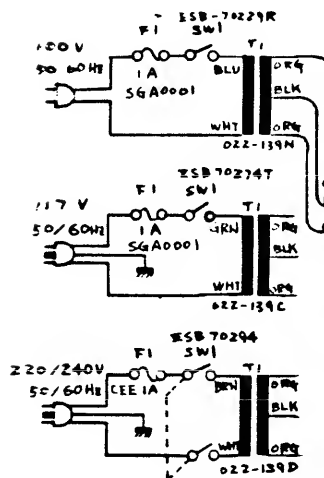
14011





OP-155C (149-155C) (052-539C)

GR-300



OP-155

VCO TUNING

1. Set controls on Guitar controller and GR-300 as illustrated above.

2. Set each TUN VR1 (#1-6) at its midpoint.

3. Play on 1st string 12th fret. A beat note will be heard.

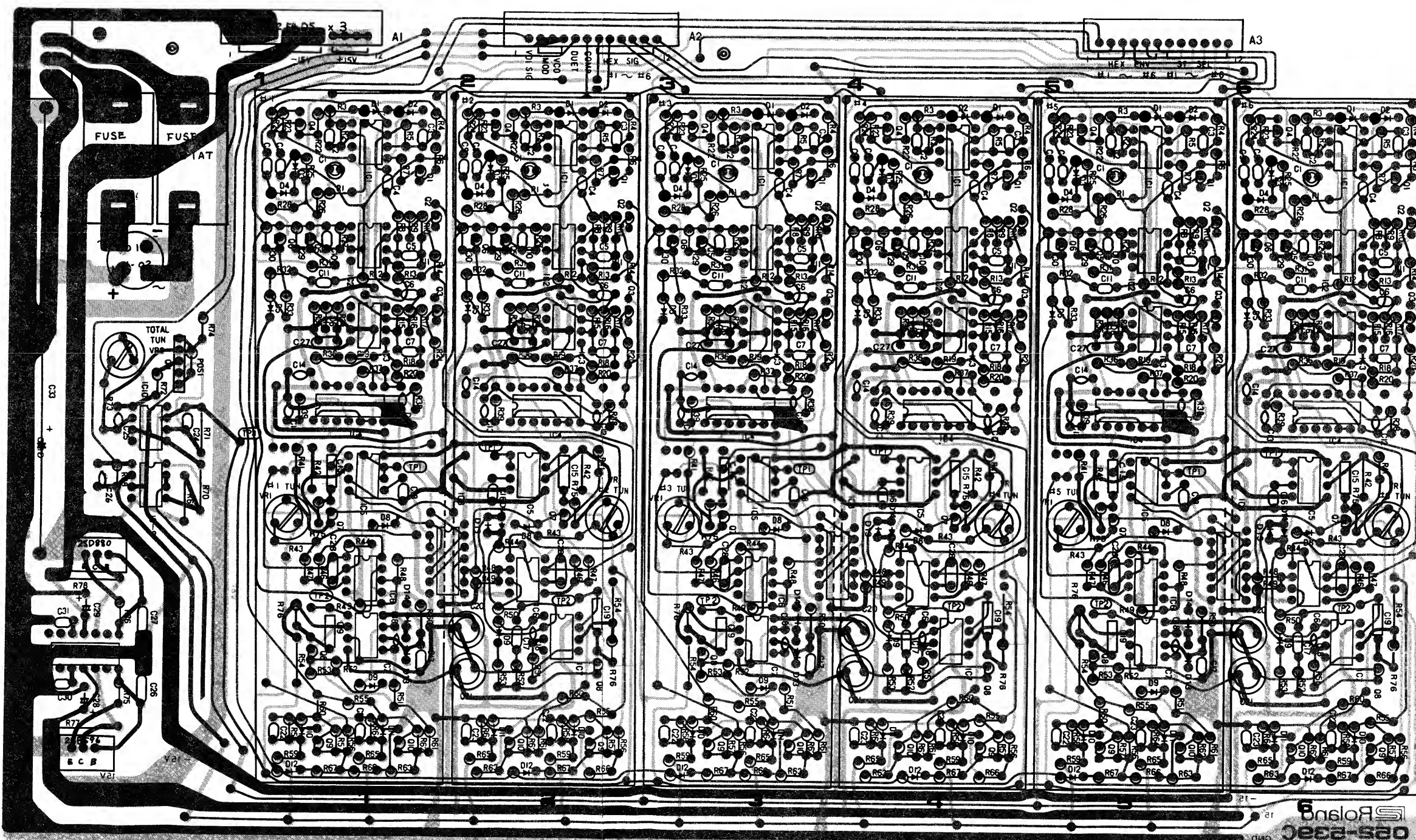
Tune VCO by turning TOTAL TUN VR2 until the beat note reaches zero (#1 TUN VR1 is left untouched).

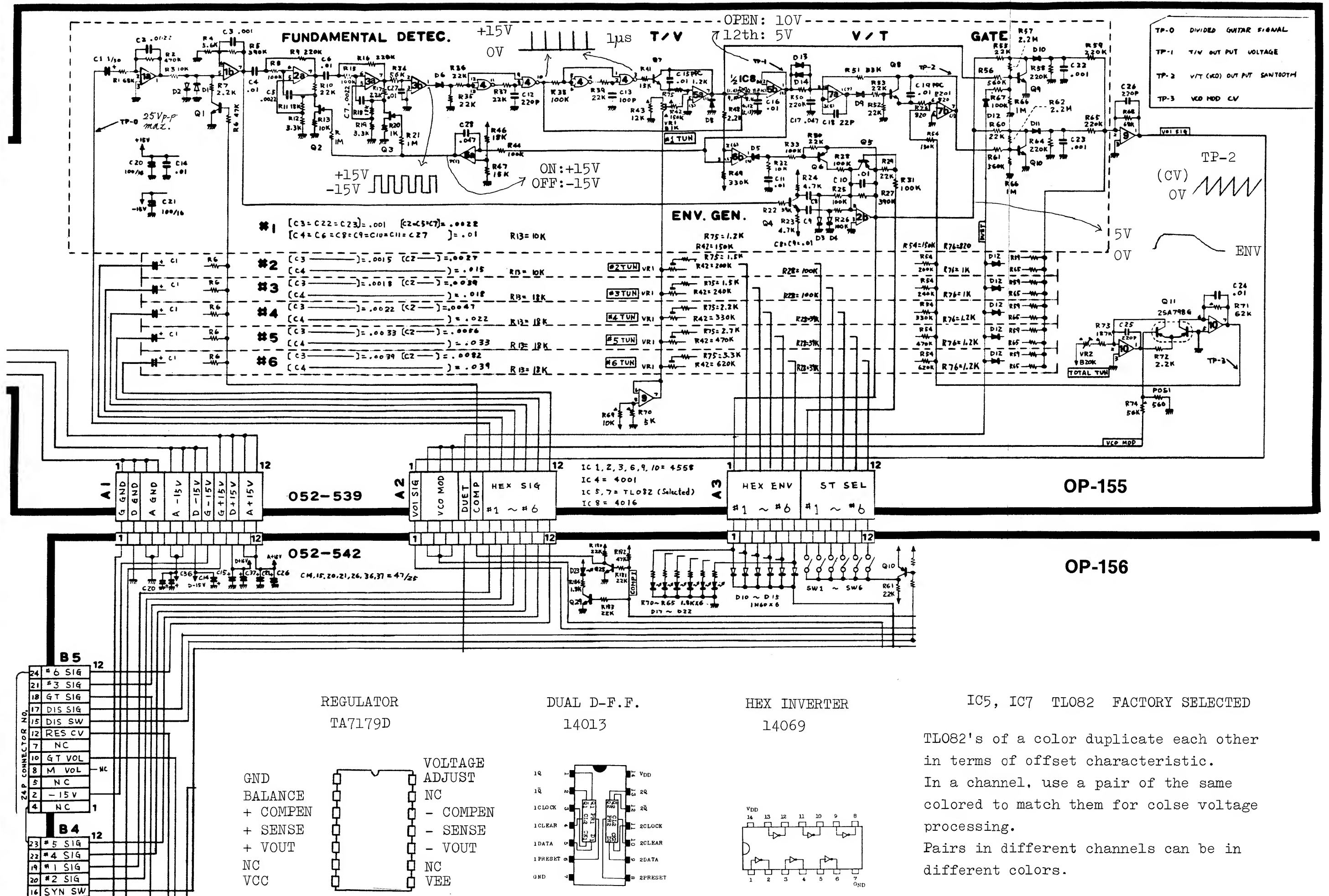
4. Pluck 2nd string with 12th fretting. Tune VCO to zero beat with #2 TUN VR1.

5. In the same manner tune #3-6 VCOs.

6. Check all strings for detune at open string and 21st fret notes.

7. Fine tune every VCO with VR1 over a string scale.





GR-300 PARTS LIST

In this parts list new numbering system
(8 digits) applies to some components.

CHASSIS. PANEL	
061-284	Chassis no.284 rear, jack
061-286	Chassis no.286 power supply
061-305	Chassis no.305 bottom w/foot no.40. 41
111-040	Rubber foot no.40 R.H.
111-041	Rubber foot no.41 L.H.
072-275	Panel no.275
108-025	Handle no.25
121-038	Washer no.38 hadle

KNOB. BUTTON	
016-043	Knob no.43 large
016-044	Knob no.44 small
016-086	Button no.86 red, power switch

SWITCH	
001-322	SW-1 foot

001-294	SSB02204	slide	
001-285	ESB70229R	power	100V
001-286	ESB70274T	CSA power	117V
001-287	ESB70294	DNS power	220/240V

JACK	
009-023	SG7630
009-024	SG7640 w/switch
009-031	SG7630G green
009-032	SG7640R red

POWER TRANSFORMER	
022-139AN	PT 139AN 100V
022-139AC	PT 139AC 117V
022-139AD	PT 139AD 220/240V

PCB ASSEMBLY	
149-155C	OP-155C (pcb 052-539C)
149-156B	OP-156B (pcb 052-542B)
149-158	OP-158 (pcb 052HL95) LED
052-544	Flexible wiring

SEMICONDUCTOR	
Transistor	
017-012	2SA733- P or Q
017-013	2SC945- P or Q
017-016	2SK30A-GR FET
017-138	2SD880- Y or O
017-148	2SB596- Y or O
017-124	2SA798G dual, common emitter

Diode	
018-014	1S2473 or 1S1588
018-027	1N60
018-082	W-02 rectifier stack
018-092	RD-5.1E zener
018-116	ESR-B33G561 posistor
019-018	TLR-105 LED foot switch
019-020	GL3AR2 LED
019-011	P-873A-G35-380 photocuplar

IC	
020-097	μPC4558C
020-103	TA7179A
020-153	μPC4559DD
020-160	BA662- A or B
020-169	MC14001B
020-170	MC14011B
020-171	MC14016B
020-176	MC14069B
020-179	MC14013B (HITACHI or MOTOROLA)
020-100	TLO82
.....	TLO82 factory selected (refer to page 11 for the detail)

POTENTIOMETER	
026-144	EVHRR360B54 50KB
026-145	EVHRR360A26 2MA
026-146	EVHRR360A15 1MA
13219758	EWJEJA315B54 50KB x 2 ganged
Trimmer	
030-489	CR19RB1K 1KB metal film
030-497	CR19RB22K 22KB
030-469	SR19RB47K 47KB carbon
030-463	SR19R4.7K 4.7KB

RESISTOR	
Metal film 1/4w 1%	
044-833	10K
044-850	200K
044-856	470K
044-913	5.6K
044-939	62K
044-941	620K
044-848	150K
044-854	330K
044-864	5K
044-915	12K
044-940	240K
044-944	187K

GR-300 continued

CONNECTOR	
010-062	SLC-1204-2324F 24 conductors
010-268	3022-12A flexible cable
110-269	FH1-12S-2.54DS flexible cable
010-272	EMCS0650M
010-273	EMCS0850M
053-416A	EMCM0645A51 wiring assy
053-417A	EMCM0825A51 wiring assy

G-808. G-303 PARTS LIST

*:G-808 only, **: G-303 only

PICKUP	
049-006	Divided No.6
	Screw 3 x 20 mm R.H. c.sunk
	Spring 3 mm
	Touch plate L, R
	* Gold ** Nickel

...	Humbucking 1st
...	Humbucking 2nd

BRIDGE	
...	* Bridge HB Brass
	* Bridge pillar HO-T Gold
	* Nylon washer
	* Nut 5 mm
...	** Bridge ST 4.5ϕ Nickel
	** Bridge stud 4 x 30 mm Nickel
	** Thumbwheel 4 mm

TAILPIECE	
...	* Tailpiece AM Brass
	* Bolt ST Gold
	** Tailpiece LP (Q) Nickel
	** Bolt ST Nickel

...	Machine head (peg) FD-1 GR
	(set of six) * Gold ** Nickel

...	Adjust rod cover GO-3
	* Brass ** Plastics
	Screw Pan H. 2.1 x 8 mm self tapping

...	End pin (strap button)
	* Gold ** Nickel
	Wood screw R.H. countersunk 3.1 x 25 mm
	Felt washer

	Rear cover
...	Pcb compartment
	Screw Flat H. c.sunk 3 x 10 mm
...	Switch compartment

SWITCH	
001-310	FTE-41B DIST/VCO
001F001	Toggle Pickup select
	Switch nut * Gold ** Nickel
KNOB	
016-127	No.127 blk
...	Gold GR w/o legend
...	Brown toggle switch

PCB ASSY	
149-157B	OP-157B (pcb 052-546B)

POTENTIOMETER	
13219107	EVHRTA304A55 500KA GUITAR TONE
13229101	EVHRUA304B54 50KB CUTOFF,RES, VIB.
13229753	EWK8DA322163 50KB.500KB MASTER VOL.
13229752	EWK8DA322B54 50KB x 2 BALANCE
064H055	Holder H55 pot.support
064-286	Holder no.286 pot.support
030-493	SR-19R 4.7kB trimmer

SEMICONDUCTOR	
018-027	1N-60 diode
018-059	1S1588 diode
020-097	uPC4558 IC
020-170	MC14011B IC

JACK. CONNECTOR	
13449104	Jack SG7713
010-094	Connector 1204-2324M 24-p
12139302	Locking shell 1204-24L1
010-270	FH1-12S-2.54DSA flexible pcb